

# Tracking Studies

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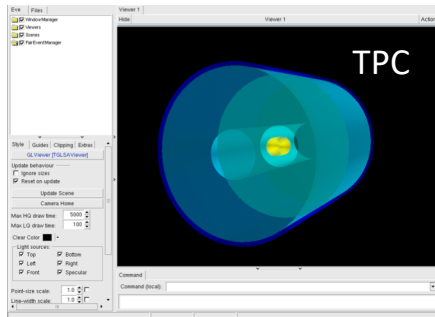
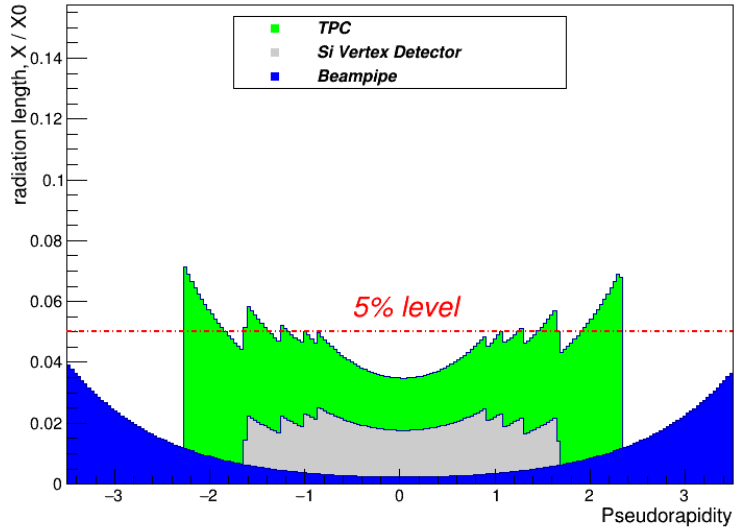
Nick Lukow

September 16, 2019

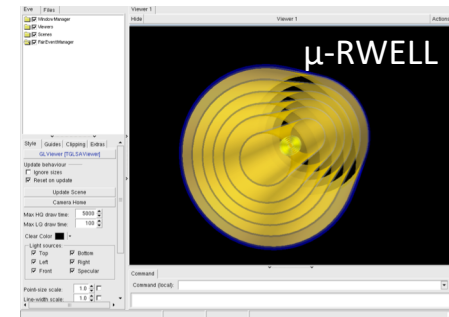
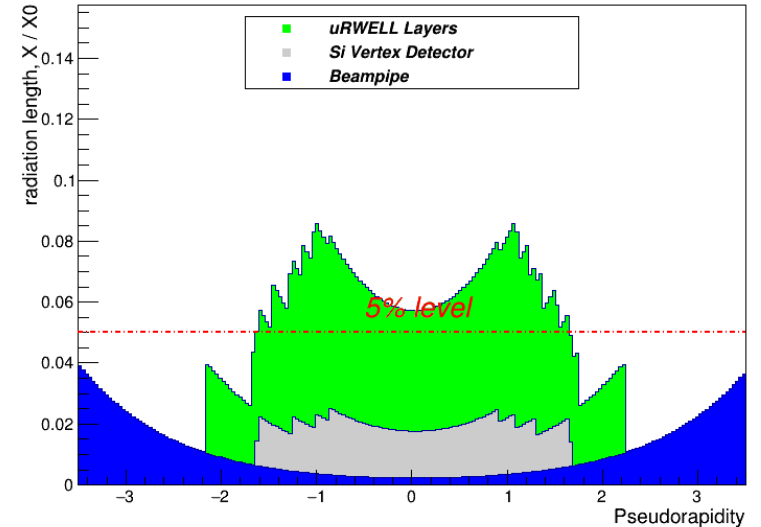
eRD6 Simulation Meeting

# Radiation Length Plots

EIC Detector Geometry: Radiation Length Scan



EIC Detector Geometry: Radiation Length Scan

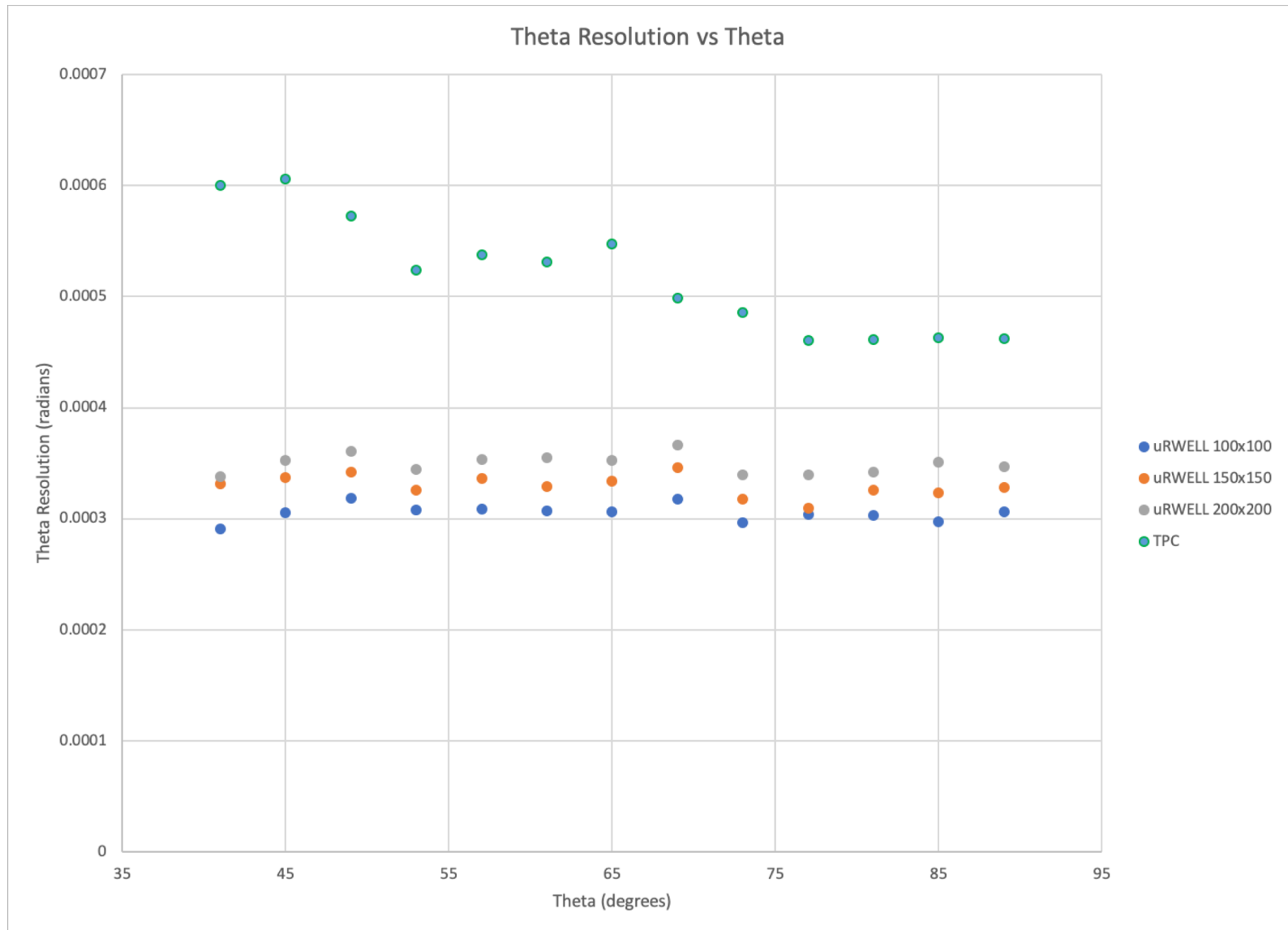


$X/X_0$  based on this:

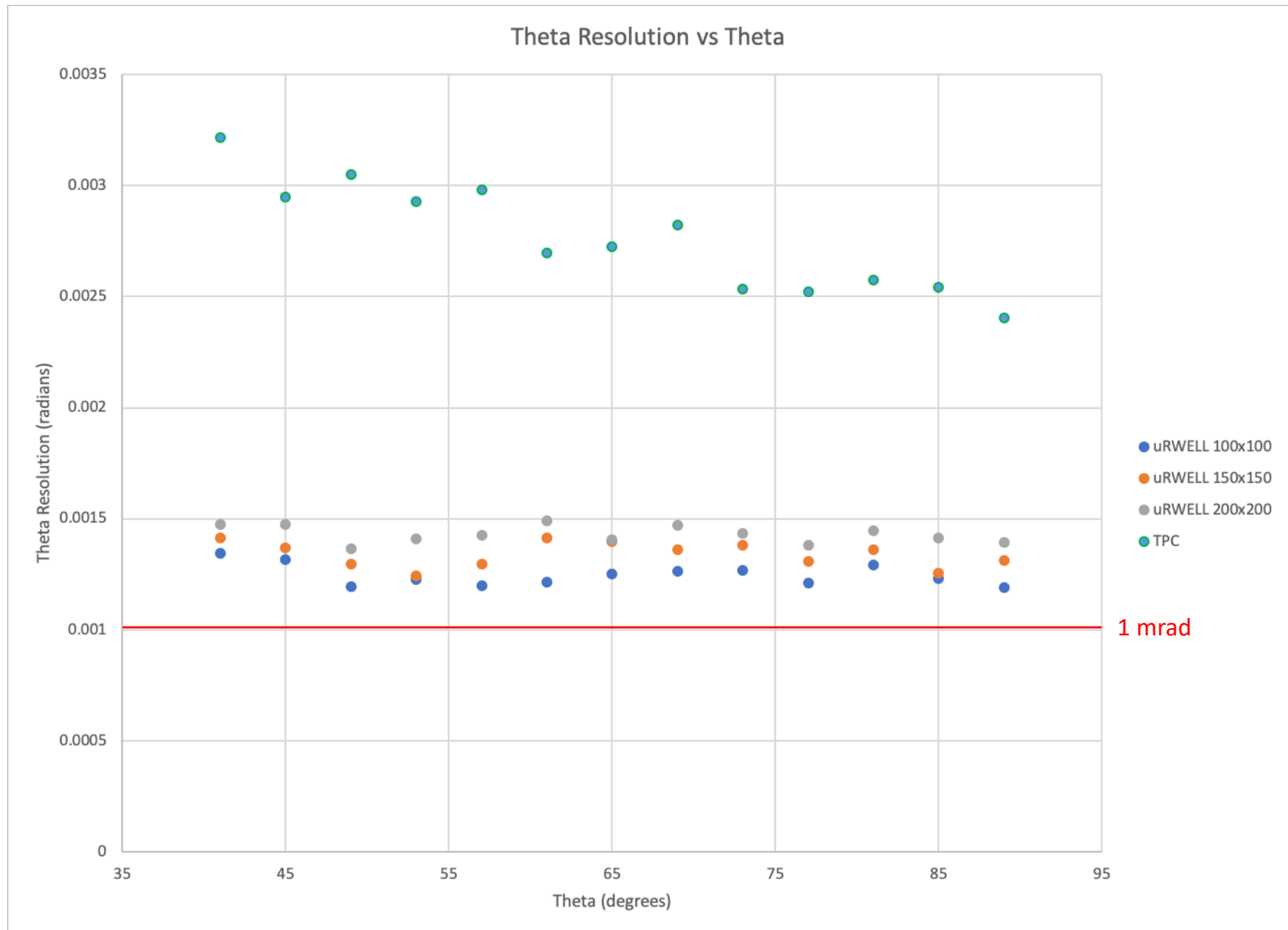
<https://wiki.bnl.gov/eic/upload/URWELL-Geometry.pdf>

And modified for 200um thick PCB

# Theta Resolution – 6 GeV electrons



# Theta Resolution – 1 GeV electrons



# To Do

- Planning to present this to the PID people next Monday and get their feedback
  - How the resolution requirements vary with momentum/theta
- Re-run simulations using pions as well
- Also start looking at  $p_t$  in addition to momentum, theta, and phi resolution.

# Backup Slides

# GEANT Options

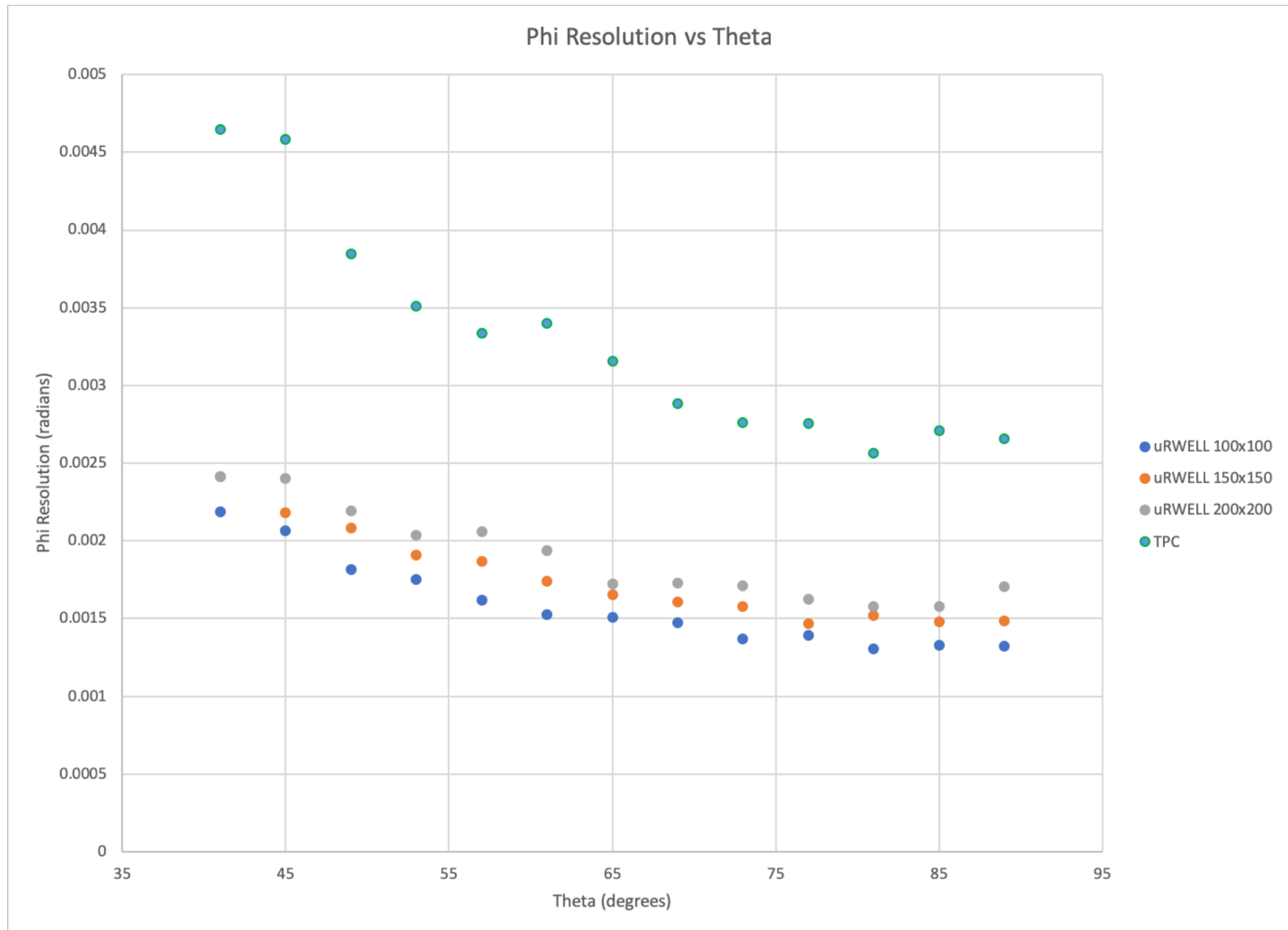
## Processes

○ Pair production, PAIR:	0
○ Compton scattering, COMP:	0
○ Photoelectric effect, PHOT:	0
○ Photofission, PFIS:	0
○ Delta rays, DRAY:	0
○ Annihilation, ANNI:	0
○ Bremsstrahlung, BREM:	0
○ Hadronic processes, HADR:	0
○ Muon nuclear interaction, MUNU:	0
○ Decay, DCAY:	0
○ Energy loss, LOSS:	2
○ Multiple scattering, MULS:	3

## Cuts

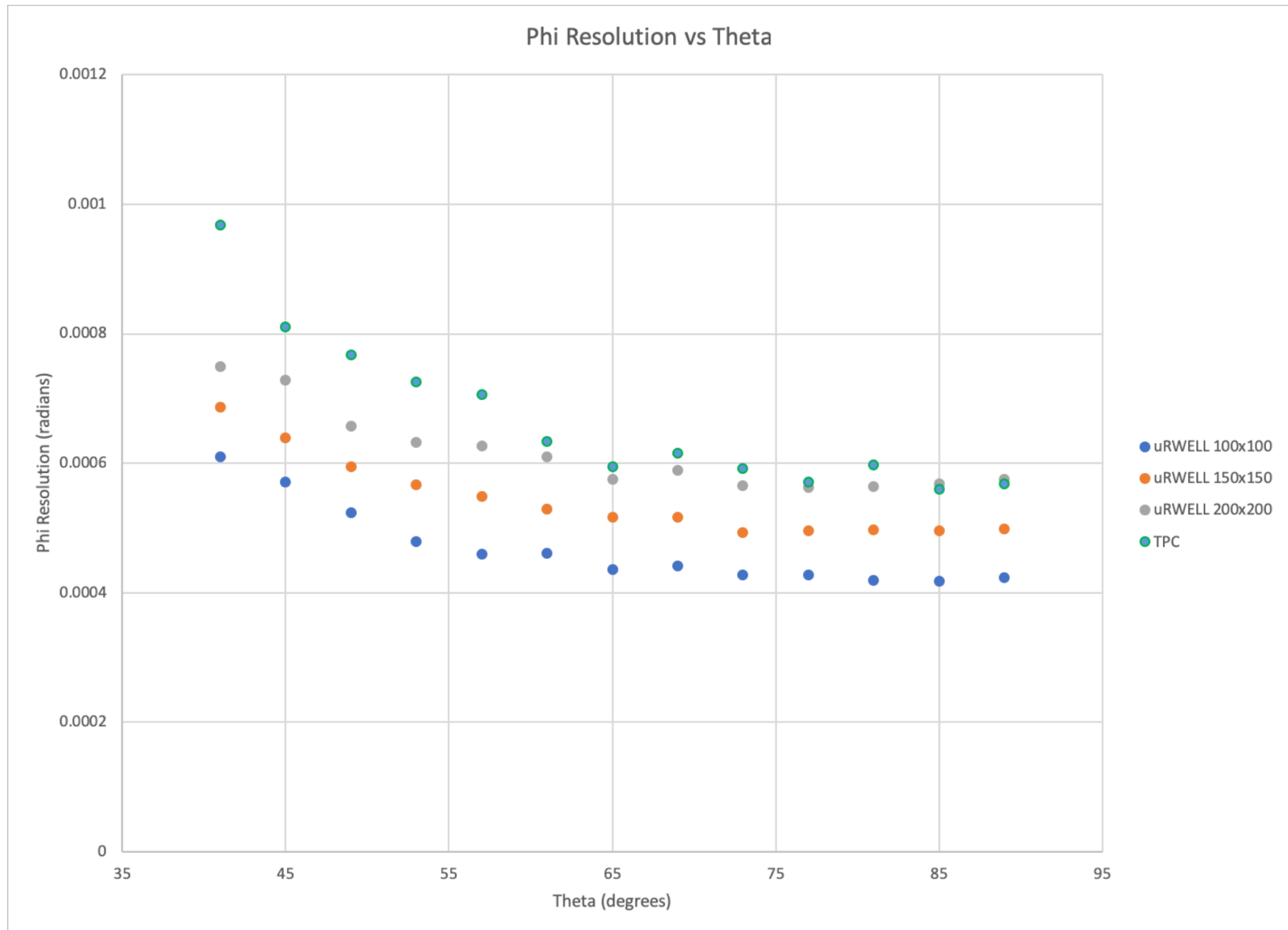
○ Gammas, CUTGAM:	1.0E-3	} (GeV)
○ Electrons, CUTELE:	1.0E-3	
○ Neutral hadrons, CUTNEU:	1.0E-3	
○ Charged hadrons, CUTHAD:	1.0E-3	
○ Muons, CUTMUO:	1.0E-3	
○ Electron bremsstrahlung, BCUTE:	1.0E-3	
○ Muon and hadron brems., BCUTM:	1.0E-3	
○ Delta-rays by electrons, DCUTE:	1.0E-3	
○ Delta-rays by muons, DCUTM:	1.0E-3	
○ Direct pair production by muons, PPCUTM:	1.0E-3	
○ Time of flight, TOFMAX:	1.0E10	

# Phi Resolution – 1 GeV electrons

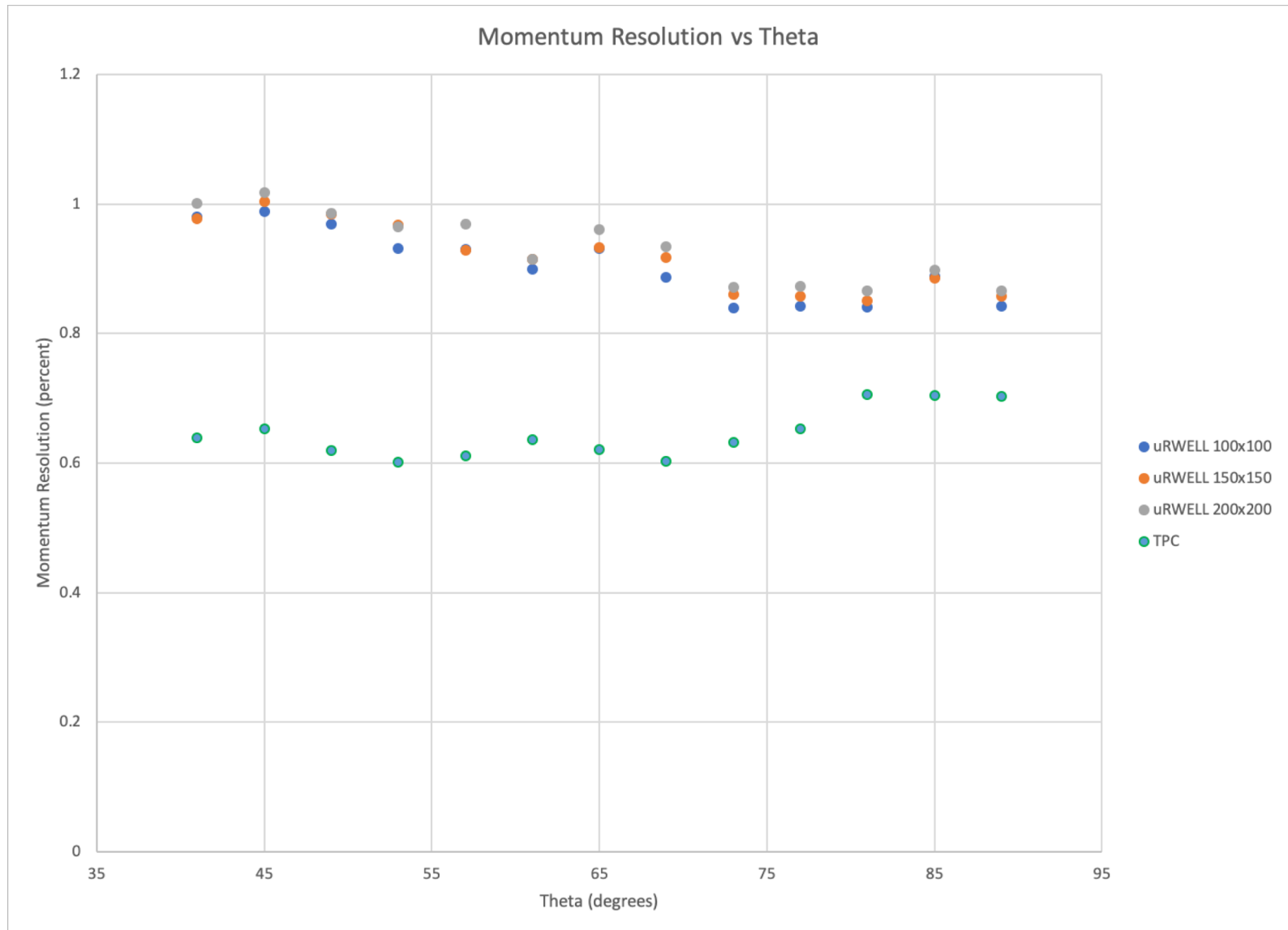




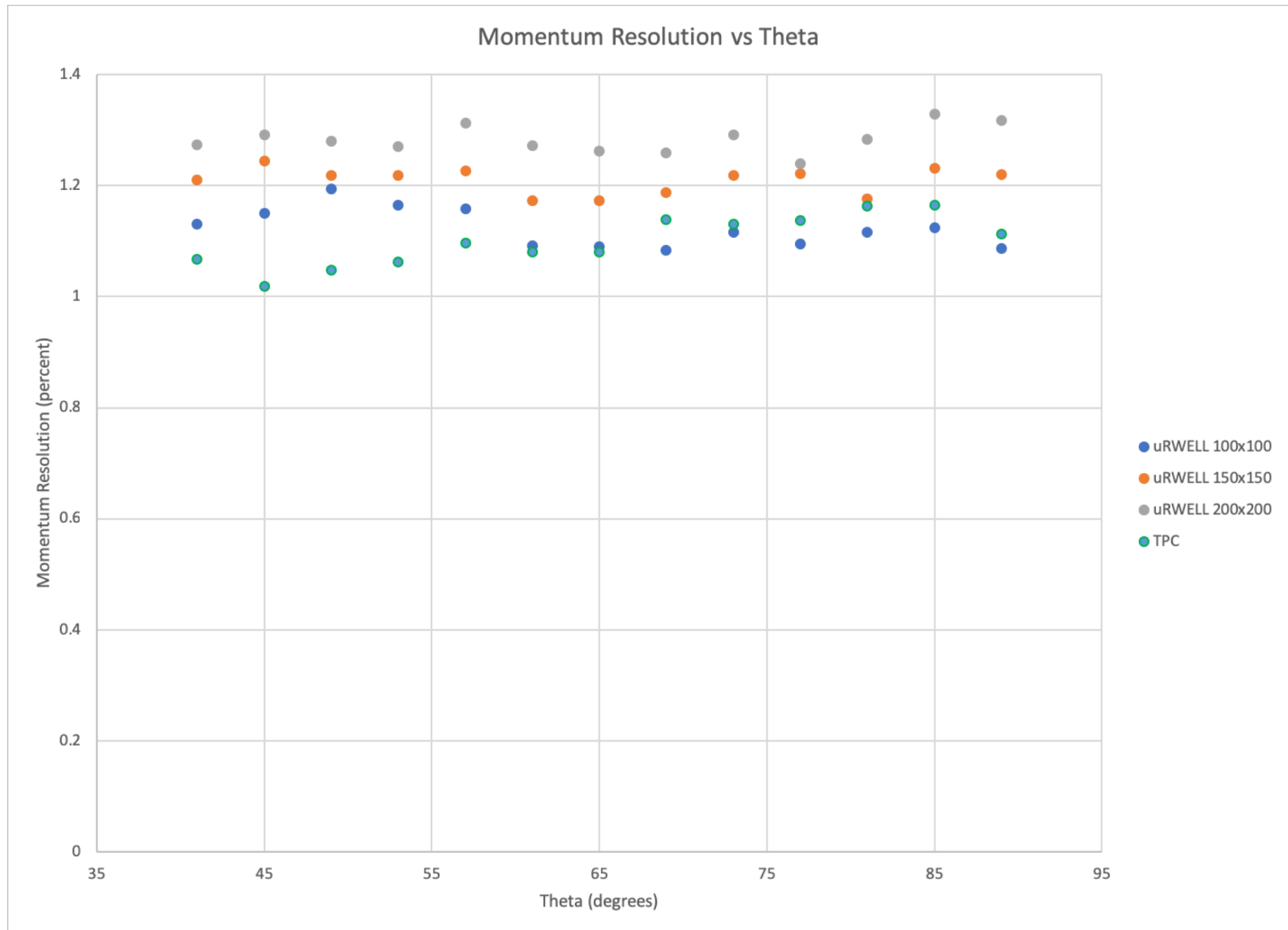
# Phi Resolution – 6 GeV electrons



# Momentum Resolution – 1 GeV electrons



# Momentum Resolution – 6 GeV electrons



# Recap – Tracking Study

Determine the resolution of tracking by comparing the track parameterizations near where the DIRC would be (approximated to be at the edge of the tracker  $\sim 81\text{cm}$ ), to the true Monte Carlo track parameters at the same location.

Use simulation of TPC to determine its performance, and treating it as a baseline.

Use a uRWELL tracker with various azimuthal/longitudinal resolution settings (applied when hits are smeared), and determine what resolution is necessary for the uRWELL layers in order to perform comparably to the TPC (or to meet specifications)

Currently studying electrons at 1 and 6 GeV thrown at various values of theta (between 0 and 1 in pseudorapidity)

